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News in This Quarter

AMSR-E Experiments Show Positive Forecast Impact

Assimilation of radiances from the NASA Earth Observing System Advanced Microwave Scanning Radiometer (AMSR-E) over the oceans leads to improved medium range forecasts in the Southern Hemisphere and neutral impacts in the Northern Hemisphere forecasts according to parallel forecast experiments conducted at the JCSDA.

The impact of the AMSR-E radiances was investigated in the National Centers for Environmental Prediction (NCEP) global data assimilation system (GDAS). The conically scanning AMSR-E observes the radiances from the atmosphere and surface of the Earth using 6 frequencies in the microwave region from 6.9GHz to 89GHz. The low frequency channels (6.9GHz and 10.7GHz) are sensitive to sea surface wind speeds and sea surface temperature and much less sensitive to hydrometeors in the atmosphere than the SSM/I instrument, which lacks these low frequency channels. Thus, the AMSR-E's information on sea surface wind and sea surface temperature can be assimilated under all weather conditions.

For the assimilation experiments, a new microwave ocean emissivity model was developed that substantially increases the emissivity accuracies at the low frequencies over that of the current operational model. The new emissivity model is a two-scale ocean roughness model with the coefficients derived from the satellite measurements. Figure 1 shows a comparison of the new model and operational emissivity model (FASTEM) in terms of the differences between the simulation and observed AMSR-E brightness temperatures.

In the assimilation experiments, the new emissivity model was applied for the channels below 20 GHz and FASTEM was used for the channels above 20 GHz. AMSR-E radiances from 10.7GHz to 36.5GHz (both polarizations) over the oceans were assimilated with the NCEP Gridpoint Statistical Interpolation (GSI) analysis system. The resolution of the forecast model was T382L62, and the experiment period was for 12 August – 11 September 2005.

The improvements in anomaly correlation at 500hPa, a measure of forecast accuracy, in the Southern Hemisphere are shown in Figure 2. Neutral impacts were found for the Northern Hemisphere and the Tropics.

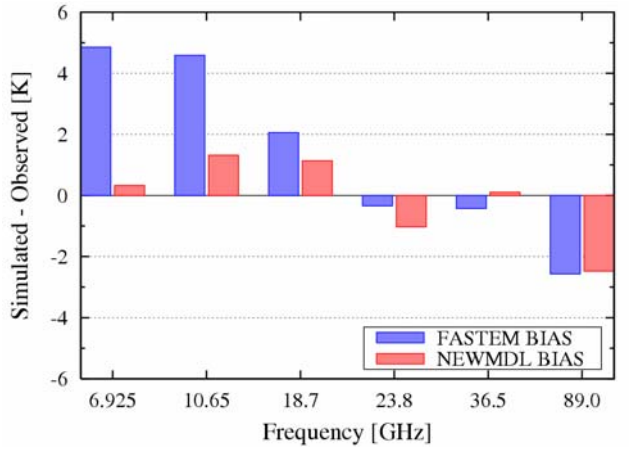

Figure 1. Differences between simulated and measured AMSR-E brightness temperatures for horizontally polarized channels. The statistics were calculated from 1-5 December 2005. Red bars indicate the bias of the new emissivity model and the blue bars indicate that of operational model (FASTEM).

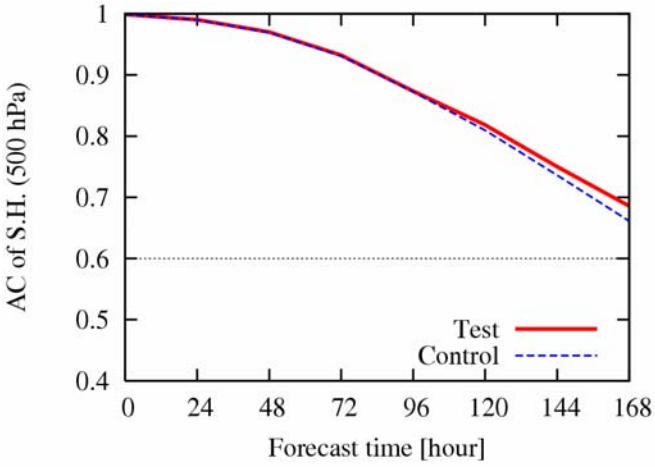

Figure 2. Averaged anomaly correlation coefficient of 500 hPa geopotential height for the Southern Hemisphere. The statistics are computed for 12 August - 11 September 2005, with 31 cases at the initial time to 24 cases for the 168 hour forecast. Red line is for Test and blue line is for Control.

These results suggest that with its all weather capability and large scan swath, AMSR-E adds substantial new information about ocean winds beyond what SSM/I and QuikSCAT already provide to the operational model. The new emissivity model enables more reliable extraction of this information.

This work was performed by JCSDA Scientific Visitor Masahiro Kazumori